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ABSTRACT

A 47-item structured Q-sort methodology was used to identify and analyze the frameworks held by experienced emergency response personnel. The questionnaire was designed to determine the following: the characteristics/behaviors considered important by people within specific fields of emergency response; differences between individuals within a specific field; and extent of agreement/disagreement between members of different groups of emergency respondents. The study sample included 13 marine fire fighting trainees, 14 industrial fire fighting trainees, 34 hazardous materials response trainees, and 36 land-based fire fighters undergoing marine fire fighting training. On the basis of their responses to the questionnaire, the four groups were determined to consist of individuals with two, two, five, and four different types of frameworks, respectively. All respondents essentially agreed on the importance of characteristics associated with teamwork, personal responsibility, and problem solving. With the exception of the marine fire fighters, all groups agreed with the items "risk taker-action oriented" and "forceful personality." The Q-sort methodology was concluded to be a feasible way of identifying differences in the frameworks of different groups of emergency response personnel, and it was recommended that the issue of frameworks be incorporated into emergency response training. (Contains 10 references) (MN)

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A Study of

Frameworks Held by Emergency Response Personnel

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A Study of Frameworks Held by Emergency Response Personnel

Emergency response personnel are a diverse group of individuals who handle situations which could result in serious adverse effects to health, safety and/or the environment. The complex responses required during larger incidents, such as an earthquake or oil spill, necessitate the formation of multi-level teams representing various areas of expertise. In many instances large multi-level response plans are available, especially within the jurisdiction of government and large industry. Practice sessions on mock disasters allow various agencies to interact, work out problems and "fine tune" their planning. Generally, there is a hierarchy of expertise and responsibility coordinating the planning and solution to critically time-dependent problems. While heuristics or formalized protocols do exist, the ill-structured nature of many emergencies often requires decisions based on incomplete information. This means that the most critical aspect of the problem solving process, developing a mental representation of the problem: is often based on inadequate information; is constrained by time pressure; and, often requires cooperation between differing groups within the team.

The mental representation of a problem is derived from prioritized perceptual cues identified by the solver as important. Since this representation guides the retrieval of appropriate solutions it is this phase of the problem solving task that is

essential (Chi, Feltovich and Glaser, 1981; Chi and Glaser, 1988; Simon, 1973; Voss and Post, 1988; Winne and Marx, 1979). The mental representation is further influenced by the amount of tacit knowledge the solver possesses (Rogoff, 1984; Scribner, 1986; Wagner and Sternberg, 1986); the strategy repertoire based on experience and expertise (Schoen, 1983; Scribner, 1984; Voss and Post, 1988); and, the environment and culture influencing personal interpretation (Scribner, 1986; Rogoff, 1988; Leont'ev, 1981).

Wertsch, Minick and Arns (1984) found that variations occurred in solving problems even though the goals and procedures followed looked basically the same. An analysis of their work revealed the variations were due to the interpretation of the problem based on the viewpoint or framework individuals brought to the situation.

Thus, the construct of framework consists of a selection of characteristics and/or behaviours which an individual has chosen as important based on previous experience. It is an influencing factor of perception which allows individuals to sort and prioritize to specific situations. Since there is a uniformity of training with respect to the understanding of goals and procedures within an emergency response group, any variations which occur must therefore be within the area of how the person interprets the setting.

With some groups, such as fire fighters who train and/or live together in a community, the nature of the job requirements assist in providing a social and cultural background which encourages a joint viewpoint (Kaprow, 1991). Members of another group, such as

a mariner who is pressed into service as a fire fighter at sea, while given specific training and drills, do not necessarily approach an emergency situation with the same framework as the rest of the crew and/or officers. This may be reflected in their actions, such as in the situation of the container ship, the Santa Clara I, where "The crew freely wandered about the deck contaminated with arsenic trioxide, despite the fact that they were warned of the danger" [human lethal dosage is about the size of an aspirin tablet] (McGowan, 1993, p. 2). Or the crew of a crude oil carrier at sea who failed to respond to a series of fire alarms [it was Sunday and their day off] ("A Contrast", 1992).

Due to the complex nature of emergency response the training of personnel involves not only the essentials of team response but also cooperation between different agencies. However, situations occur where there is a "difference of opinion" on how to handle the problem and, in some cases, the extent of the hazard within the situation. This was exemplified in the study by Stuhlmiller (1994) done as follow-up interviews with various groups of responders to a collapsed highway overpass in the 1989 San Francisco earthquake. The interviews revealed a tremendous sense of frustration dealing as a coordinated group with other responders at the incident. In some instances individuals commented that they had no idea what the other agency was even doing there. This "difference of opinion" was also identified by some individuals as a hinderance to rescue efforts.

Individual and group priorities are complex, often changing

with the situation, and not necessarily implying one set of items is mutually exclusive to all others. However, an understanding of the range and priority of items which are considered by an individual or group to be important would provide a greater understanding of the problem formation processes, specifically in emergency situations. Ford (1986) found that often the personal importance of various items, such as safety (both physical and mental), were often not obvious or revealed since individuals are under the constraints of social, cultural and environmental factors. This means the importance or priorities individuals set for themselves cannot always be inferred from their actions. Individuals must be specifically asked for their opinion outside of the constraints usually imposed by their environment.

Since time is the one element that is usually not available during emergencies, it would be advantageous to understand the frameworks various groups bring to the problem situation. This understanding could be a valuable component of the training process and assist personnel to understand the other groups as they interact with other emergency response agencies and negotiate solutions.

This research attempts to better understand the frameworks held by experienced emergency response personnel. It seeks to (a) determine those characteristics or behaviours which are considered important by people within specific fields of emergency response; (b) determine whether or not a difference of opinion exists in those characteristics and behaviours between individuals within a

specific field; and, (c)determine on a comparative basis the areas and extent of agreement and disagreement between members of different groups of emergency responders.

Instrument

A 47-item structured Q-sort methodology (Kerlinger, 1973) was used to measure opinion of importance among characteristics and behaviours of emergency response personnel, the independent variable in this study. The items in the Q-sort consist of words or short phrases describing personal traits, actions or competencies related to four specific emergency response fields. The structured sorting resulted in a quasi-normal distribution which also added the feature of requiring a decision from the subjects regarding the items. The Q-sort methodology was selected due to the exploratory nature of the research, as well as the logistics of gathering reflections and judgements about a person's profession in a one hour lunch-time meeting.

These items were generated as the compilation from a questionnaire filled out by representatives of four different emergency response groups, some of whom are associated with the training facility where the study was conducted and four course instructors from that facility. The question asked respondents to list as many characteristics and/or behaviours which in their opinion represented the ideal emergency response individual. This question was asked since their response would indicate

characteristics or behaviours which were considered to be the most important or valued based on actual, situational experience. It was emphasized they were being asked only for an opinion based on their experience in their particular field. An additional sheet was included requesting their background training and experience in emergency response.

The respondents to the questionnaire and their average years of experience working in the area of emergency response included: 3 metropolitan fire chiefs (28 years), 4 ship's captains (27.5 years), 2 marine-industrial professionals (13.5 years), 3 industrial hazardous materials professionals (16.5 years), 2 volunteer fireman (10 years), 5 instructors from the training facility (8.5 years [range 4-18] as instructors and 17 years previous experience in the field). Although the respondents are different in their focus, there is considerable overlap in their professions due to the complex nature of emergency response. It was anticipated that the results would include not only those qualities which would be necessary across various professions, but also those characteristics unique to specific areas, such as industry or marine. The returns appear to have generated a semi-exhaustive list of characteristics and/or behaviours which experienced professionals consider to represent the important attributes of an emergency response individual. See Table 1.

Table 1.

Randomly Numbered List of Priority Items for Emergency Response Personnel

1. Practical, has common sense
2. Good field training
3. Think clearly under pressure
4. Ability to take orders
5. Independent enough to question if necessary
6. Trust a superior's judgement
7. Personal integrity
8. Sincere and up front
9. Emotionally stable - not thrown by a traumatic situation
10. Intelligent
11. Physically fit
12. Forceful personality
13. Positive attitude
14. Tactful
15. Patient - tolerant
16. Sense of humour
17. Friendly
18. Good at public relations
19. Involved in bettering job environment
20. Community minded
21. Adaptable or flexible in a situation
22. Resourceful
23. Broad background knowledge

Table continues

24. Risk taker - action oriented
25. Aware of personal limitations
26. Cautious
27. Commitment to task
28. Able to identify relevant information
29. Able to make decisions based on limited input
30. Mechanically inclined
31. Able to act independently
32. Good communication skills
33. Open to other ideas or opinions
34. Good leadership qualities
35. Able to take and accept responsibility
36. Able to stay calm
37. Disciplined
38. Good knowledge base
39. Compassionate
40. Self-confident (not over-confident)
41. Courageous
42. Work as part of a team
43. Able to make quick, accurate decisions
44. Systematic record keeper
45. Possess first aid skills
46. Possess management skills
47. Able to take initiative

Design and Procedure

The study was conducted at The British Columbia Safety Training Centre (BCSTC) and Fire Academy in Maple Ridge, British Columbia, Canada. BCSTC is the field training facility of the Justice Institute of British Columbia, Burnaby, B.C., Canada. The training courses range from industrial and marine fire fighting to tanker car safety and hazardous materials. The facilities include railway tank cars, a ship/building mock up, a smoke house, and a variety of fire training pads. Over the period of one year between 1500 to 2000 men and women from many different backgrounds and with a wide range of previous expertise may be trained.

The emergency response groups trained at this facility consist of: full-time fire fighters, volunteer fire fighters, industrial emergency response, which includes fire fighting and/or hazardous materials, students who want to apply for positions in emergency response fields, and mariners (various levels of certification).

Subjects

Four different training groups were involved.

I. Marine Fire Fighting Trainee Certification course consisted of 1 class - 16 subjects (3 omitted) with a range of background experience in emergency response from 0 - 15 years [occupations included mariner, ambulance attendant, student, unemployed].

II. Industrial Fire Fighting consisted of 2 classes - 19

subjects (5 omitted) with a range of background in emergency response from 0 - 9 years [representing oil, gas and pipeline companies].

III. Hazmat Awareness and Operations consisted of 4 classes - 37 subjects (3 omitted) with a range of experience in emergency response from 0 - 30 years [representing Coast Guard, communities as fire fighters and public works, industry].

IV. Marine Fire Fighting for Land Based Fire Fighters consisted of 4 classes - 38 subjects (2 omitted) with a range of experience from 11 - 26 years [the majority were officers from different municipalities, 2 junior fire fighters].

Omissions were the result of missing cards, too many cards in one category or incomplete test packages. A limited amount of background information was collected due to the time constraints for data collection. Subjects were asked: profession; total years experience in that profession; experience or coursework in emergency response; and, a brief occupational background. All courses ran from 8:30 to 4:00 with one hour for lunch. Subjects commuted to the site and all courses required hands on training, often physically strenuous.

Method

A structured Q-sort consisting of 47-items was used to measure opinion of priorities among characteristics and/or behaviours of

emergency response personnel which are considered important within the emergency response fields represented. Items were rank ordered according to an individual's personal opinion from "Most Important" to "Least Important". A quasi-normal distribution of items was required to force discrimination of items. The forced decision process was difficult for some of the subjects, since it required them to make choices which under normal circumstances they might not make.

It was explained to each group that the items had been generated by input from a variety of people in related fields. Further, all items, while considered important, might change in priority depending upon the specific problem situation. With this in mind they were asked to prioritize from a general view of emergency response rather than with one particular situation in mind. At the end of the Q-Sort each group was asked if there were any categories or items omitted in the selection. No other items were added, although several people commented that specific, different items should not, in their opinion, have been included. Therefore, it was concluded that a representative sample of the characteristics and/or behaviours from the population of emergency response personnel had been gathered. The design of the Q-sort and the scoring scheme is given in Table 2.

Table 2.

Design and Scoring Scheme for the Q-Sort

Evaluation Criterion	Most Important									Least
Category	1	2	3	4	5	6	7	8	9	10	11
Frequency	2	3	4	5	6	7	6	5	4	3	2
Q-Sort Weight	11	10	9	8	7	6	5	4	3	2	1

M = 47 items

Reliability and Validity

The Q-sort methodology in this study is a dependency analysis using a comparative ranking procedure based on opinion. While item independence was encouraged by explaining the cards could be rearranged at any point the placement of any one card is based on the position of any other card. Thus, this is an ipsative methodology with the added confounding dimension of a training session immediately following the sampling. All of these constraints imply the possibility of anticipated change making the traditional sort, re-sort reliability inappropriate. Kerlinger (1973) suggested the reliability issue be restated in terms of whether or not the same predominant types or patterns reappear over repeated occasions. With the exception of Group I, where only one class was sampled, all Groups have subjects represented in each resulting Type. Therefore, specific types are appearing over repeated occasions, upholding the reliability of the methodology.

Validity was determined by having the 5 instructors assist in development of the 47 items, then participate in a separate Q-sort. At the end each was asked if any item was omitted. This same question was asked in each class. Nothing could be added to the range of items, although there was considerable debate over item #24 risk taker - action oriented. This characteristic was felt by some instructors to be a liability in an emergency with the potential of putting others in danger, thus it should not be included. Other instructors felt that it was an indication of

self-reliance and was a vital component of emergency work.

Results and Interpretation

The responses of each subject within a group were correlated with every other subject pattern of scores in order to determine common patterns of priorities. Intercorrelations were calculated within each of the four groups to identify the least number of common patterns that could adequately represent the subjects' opinions. From this a factor array was produced within each group. Subjects were typed on the basis of the group with which they were most highly correlated.

I. Marine Fire Fighting Trainees (13 subjects). Within this group the subjects agreed on 62% of the items. A consensus item is one in which the difference in Z-score between the largest and smallest is less than 1.00. The greatest agreement was on the importance of #3 - think clearly under pressure [Z difference = 0.0117]. The differences between the subjects fall into two Types:

Type A (11 subjects) puts high priority on:

43 - quick, accurate decisions

36 - able to stay calm

3 - think clearly under pressure

2 - good field training

38 - good knowledge base

42 - work as part of a team

Type B (2 subjects) puts high priority on:

23 - broad background knowledge

5 - Independent enough to ask questions

3 - think clearly under pressure

22 - resourceful

34 - good leadership qualities

38 - good knowledge base

Type A puts lowest priority on:

16 - Sense of humour

24 - risk taker - action oriented

17 - friendly

Type B puts lowest priority on:

16 - sense of humour

14 - tactful

6 - trust a superior's judgement

The items with the greatest disagreement (ranked respectively):

42	- work as part of a team	6;43
36	- able to stay calm	2;22
6	- trust a superior's judgement	28;47
24	- risk taker- action oriented	46;16

No common factor appears in the background to denote membership by Type. A close examination shows that Type A sees themselves as a knowledgeable part of a team effort in an emergency. Type B acknowledges the responsibility for a good

information base but sees the response to an emergency as more of an individual effort, relying more on individuals than group membership to solve the problem.

II. Industrial Fire Fighting (14 subjects-2 classes). This group had a consensus on 91% of the items. The greatest agreement was on four items: #25 - aware of personal limitations [Z difference = -.009]; # 34 - good leadership qualities [Z difference = -.02]; #4 - ability to take orders [Z difference = .02]; and, #31 - able to act independently[Z difference = .082]. The differences between the subjects fall into two types:

Type A (12 subjects) puts high priority on:

36 - able to stay calm

3 - think clearly under pressure

21 - adaptable or flexible in a situation

9 - emotionally stable - not thrown by a traumatic situation

42 - work as part of a team

32 - good communication skills

Type B (2 subjects) puts high priority on:

3 - think clearly under pressure

28 - able to identify relevant information

32 - good communication skills

42 - work as part of a team

29 - able to make decisions based on

limited information

43 - able to make quick, accurate decisions

Type A puts lowest priorities on:

12 - forceful personality

24 - risk taker - action oriented

Type B puts lowest priorities on:

17 - friendly

16 - sense of humour

No common factor appears in the background to denote membership by Type. Both Types are concerned with teamwork and communication skills. Type A adds to that the importance of personal characteristics while Type B emphasizes the individual problem solving aspect of the situation. Of interest is the close agreement on the four items above which could be seen as being problematic in an emergency since they imply opposite, perhaps conflicting, actions.

III. Hazmat (34 subjects - 5 classes). This group broke into five types. There is considerable overlap in terms of opinion. Type A (15 subjects) puts a high priority on:

3 - think clearly under pressure

36 - able to stay calm

2 - good field training

28 - able to identify relevant information

42 - work as part of a team

21 - adaptable or flexible in a situation

Type B (5 subjects) puts a high priority on:

42 - work as part of a team

43 - able to make quick, accurate decisions

1 - practical, has common sense

32 - good communication skills

22 - resourceful

2 - good field training

Type C (8 subjects) puts a high priority on:

3 - think clearly under pressure

43 - able to make quick, accurate decisions

29 - able to make decisions on limited input

36 - able to stay calm

32 - good communication skills

Type D (4 subjects) puts a high priority on:

36 - able to stay calm

3 - think clearly under pressure

1 - practical, has common sense

43 - able to make quick, accurate decisions

42 - work as part of a team

38 - good knowledge base

Type E (2 subjects) puts a high priority on:

3 - think clearly under pressure

21 - adaptable or flexible in a situation

1 - practical, has common sense

36 - able to stay calm

47 - able to take initiative

29 - able to make decisions on limited input

Type A puts lowest priority on:

24 - risk taker - action oriented

12 - forceful personality

Type B puts lowest priority on:

19 - involved in bettering job environment

24 - risk taker - action oriented

Type C puts lowest priority on:

17 - friendly

20 - community minded

Type D puts lowest priority on:

12 - forceful personality

24 - risk taker - action oriented

Type E puts lowest priority on:

12 - forceful personality

46 - possess management skills

No common factor appears in the background to denote membership by Type. Most of the subjects are firefighters (full time as well as volunteer); the remaining subjects work as engineers or environmental personnel for cities or large firms. All five Types appear to have a common framework regarding individual, professional traits and personal qualities directly related to a hazardous incident. The importance of teamwork differs between

Types A-D and Type E, where it is ranked 26/47. Of particular interest are two traits listed as Least Important by several Types (ranked respectively):

24 risk taker - action oriented 46;47;45;47;43

12 forceful personality 47;43;41;46;46

Again, there is a commonality of opinion that these two characteristics appear to be problematic.

IV. Land Based Fire Fighters - Marine Training (36 subjects -5 classes). This group broke into four types.

Type A - (13 subjects) puts high priority on:

37 - Disciplined

1 - practical, has common sense

3 - think clearly under pressure

42 - work as part of a team

36 - able to stay calm

43 - able to make quick, accurate decisions

Type B - (4 subjects) puts high priority on:

43 - able to make quick, accurate decisions

13 - positive attitude

35 - able to take and accept responsibility

34 - good leadership qualities

1 - practical, has common sense

8 - sincere and up front

Type C - (11 subjects) puts high priority on:

43 - able to make quick, accurate decisions

3 - think clearly under pressure

42 - work as part of a team

36 - able to stay calm

1 - practical, has common sense

32 - good communication skills

Type D - (8 subjects) puts high priority on:

43 - able to make quick, accurate decisions

3 - think clearly under pressure

32 - good communication skills

35 - able to take and accept responsibility

1 - practical, has common sense

42 - work as part of a team

Type A puts low priority on:

12 - forceful personality

24 - risk taker - action oriented

Type B puts low priority on:

6 - trust a superior's judgement

12 - forceful personality

Type C puts low priority on:

24 - risk taker - action oriented

44 - systematic record keeper

Type D puts low priority on:

12 - forceful personality

20 - community minded

No common background for any Type was found. Each Type has fire fighting officers primarily, the rest of the subjects consist of volunteer fire fighters and/or fire fighters with lower rank.

Of particular interest is the level of agreement across all groups. All Types agreed on the following as being Most Important:

1 - practical, has common sense

43 - able to make quick, accurate decisions

Types A,C,D included item 42 - work as part of a team in the first six items, Type B ranked it as 7, thus they essentially agree.

Type B included #34 - good leadership qualities. The other Types listed it respectively as 10,10,8; thus, they essentially agree.

Although, Type B puts more emphasis on what could be considered individual Management/Leadership characteristics than the other groups, all Types agreed on the problematic characteristics of items 24 and 12 (ranked respectively):

24 - risk taker-action oriented, 47;45;46;44

12 - forceful personality, 46;47;45;46

Conclusion

The results of this study indicate the feasibility of the Q-sort methodology to identify a range of importance between differing groups among those characteristics which were considered components of emergency response. While variations in Types occurred within each group, there was essentially an agreement on the importance of characteristics associated with teamwork, personal responsibility, and problem solving. With the exception of Group I., Marine Fire Fighting, all groups and types agreed with the issue of items 24 - risk taker - action oriented and 12 - forceful personality. Whenever these items appeared as low priorities item 42 - work as part of a team was given high(er) priority. Therefore, differences of opinion between groups does occur, indicating differing frameworks through which individuals view emergency situations.

It is also important to acknowledge the constraints of this methodology in attempting to extrapolate to larger groups from these results. Instead, these results have value in identifying areas for further research. All of the groups involved in this study were associated with training in fire fighting which may have been the reason for so much uniformity of opinion. Other groups should be tested for an expanded perspective on frameworks with a goal of including an understanding of other group's viewpoints as part of all training programs.

The importance of this research may be seen by referring to the Stuhlmiller (1994) study mentioned before. A key to analyzing

the overall sense of frustration between groups working on the collapsed overpass may be seen in mottoes from two of the groups represented. Municipal fire fighters will explain that in an emergency "You never swap one life for another" (Personal communication); while the military Parajumpers involved in the rescue efforts had badges with the motto "We Do This So Others May Live". These mottoes imply a training framework. It may not necessarily be obvious to other groups given the extreme stress and time constraints in an emergency but when the construct of frameworks is analyzed the difference between the two groups becomes apparent. If the issue of frameworks can become an aspect of training then the groups will have a greater chance of successfully cooperating in an emergency without the frustration often encountered.

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